AD-A104 667 ARMY ENGINEER DISTRICT ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LAKE TURNER DAM (MO 30266), MISSIS--ETC(U)
SEP 78

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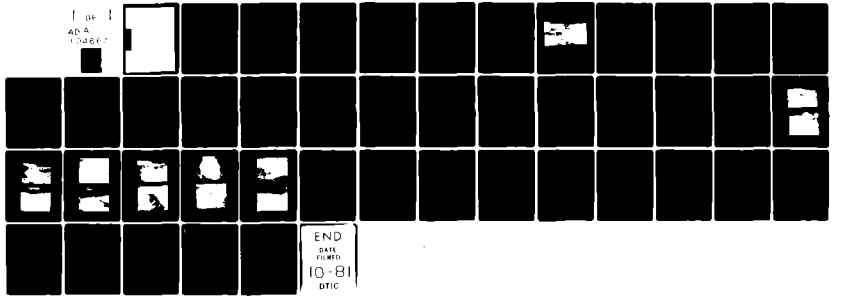

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1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A104 667	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Phase I Dam Inspection Report National Dam Safety Program Lake Turner Dam (MO 30266) Dent County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report
	6. PERFORMING ORG. REPORT NUMBER
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National Dam Safety Program. Lake Turner Dam (MO 30266), Mississippi-Kaskaskia-St. Louis Basin, Dent County, Missouri. Phase I Inspection Report.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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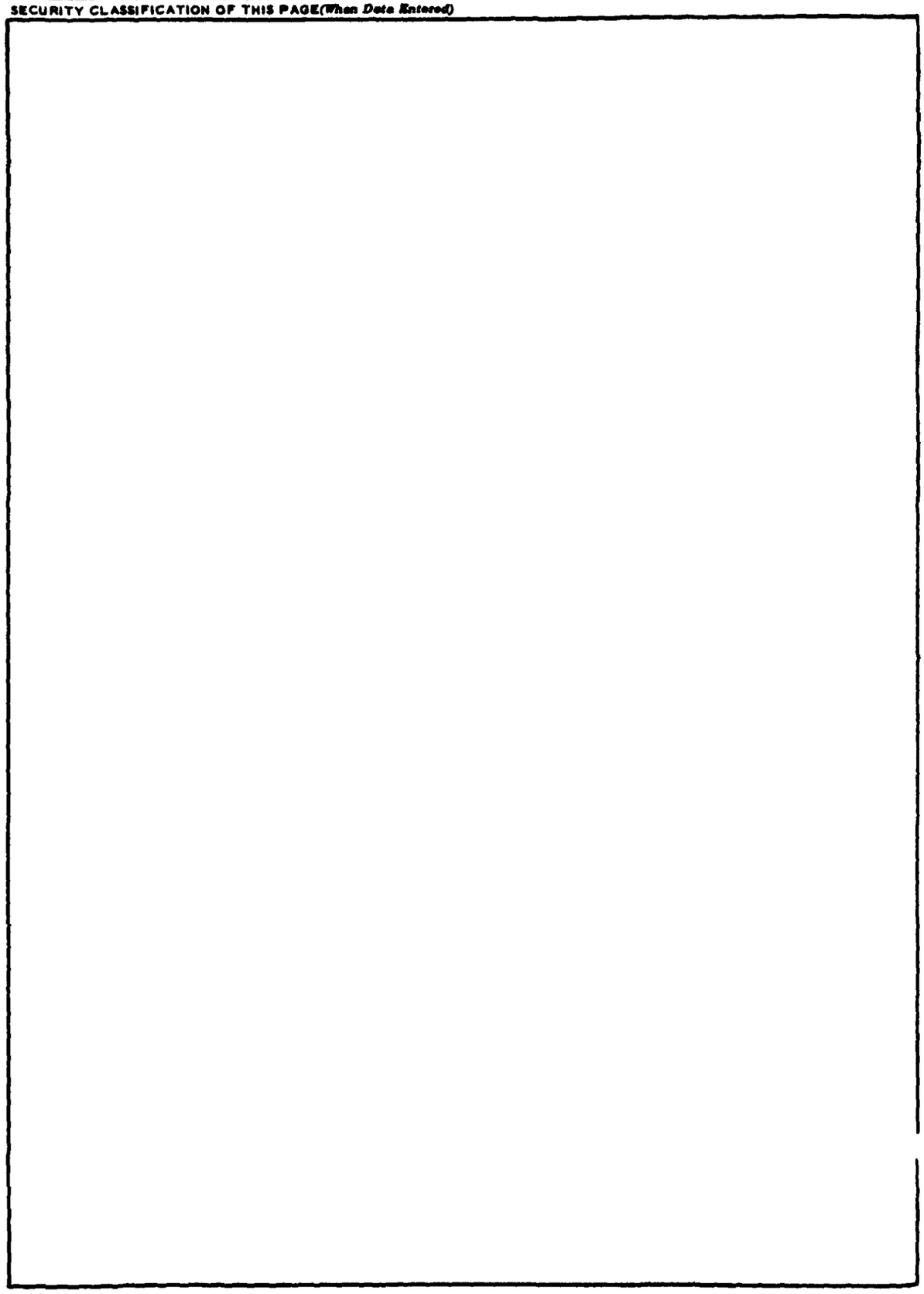

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☆ U.S. G.P.O. 1986-606-147 1293

SPRING CREEK BASIN

TURNER LAKE DAM
DENT COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30266

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: ST. LOUIS DISTRICT CORPS OF ENGINEERS
FOR: GOVERNOR OF MISSOURI

SEPTEMBER 1978

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Turner Lake Dam
State Located	Missouri
County Located	Dent
Stream	Spring Creek
Date of Inspection	5 September 1978

Turner Lake Dam No. Mo. 30266 was inspected using the "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed by the Chief of Engineers, U. S. Army, Washington, D. C., with the help of Federal and state agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Three houses and associated buildings, two improved roads and one railroad would be subjected to flooding with possible damage and/or destruction and possible loss of life. Turner Lake Dam is in the small size classification since it is greater than 25 feet high but less than 40 feet high and impounds less than 1000 acre-feet of water.

Our inspection and evaluation indicates that the spillway of Turner Lake Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The spillway of Turner Lake Dam will pass a 1 percent chance flood (100-year flood) without overtopping the dam. Turner Lake Dam is a small size dam with a spillway that will pass 20 percent of the Probable Maximum Flood without overtopping the dam. The guidelines require that a dam of this size and hazard potential (high) pass one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping the dam. Since the spillway of Turner Lake Dam is not capable of passing a minimum of one-half (50 percent) of the PMF without overtopping and causing failure, the spillway is considered seriously inadequate and the dam is accordingly classified as an unsafe, non-emergency structure. The 1 percent chance flood is defined as a flood that has a 1 percent chance of being exceeded in any given year.

Other deficiencies visually observed by the inspection team were the need to maintain a grass cover on the embankment by cutting the tall vegetation to prevent it from providing animal habitat and possible burrowing by such animals; lack of erosion protection on the dam and emergency spillway; erosion and undermining at the end of the 18 inch diameter discharge pipe. The lack of stability and seepage analyses on record is a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described.

ANDREW G. HEYDINGER
Soils Engineer
St. Louis District
Corps of Engineers

CHIEN H. HSIEH
Hydraulic Engineer
St. Louis District
Corps of Engineers

SUBMITTED BY: _____ 27 Sept 78
Chief, Engineering Division — Date

APPROVED BY: _____ 27 Sep '78
Colonel, CE, District Engineer — Date

OVERVIEW OF LAKE AND DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TURNER LAKE DAM - ID NO. 30266

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TURNER LAKE DAM - ID NO. 30266

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Turner Lake Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) Turner Lake Dam is an earth fill dam.

(2) The outlet works consist of a 18 inch steel pipe conduit with 3 feet diameter drop inlet. The emergency spillway is located on the right side of the dam and is grass covered.

b. Location: Section 17, Township 34 North, Range 6 West.

c. Size Classification: Small.

d. Hazard Classification: High

e. Ownership. Major and Mrs. Peter Turner, Salem, Missouri, 65560.

f. Purpose of Dam. Recreation lake.

g. Design and Construction History. The dam was constructed in 1972. Design guidiance was provided by the Soil Conservation Service (SCS). No preconstruction design information or detailed construction data other than the information SCS has available are known to exist. The SCS data are of advisory nature.

h. Normal Operating Procedure. No operating records exist. Outflow passes through an ungated steel pipe and emergency spillway.

1.3 PERTINENT DATA

a. Drainage Area.

(1) 58 Acres between Ziske Dam and Turner Dam.

(2) 433 Acress (Total drainage area including drainage area above Ziske Dam.)

b. Discharge at Damsite.

(1) All discharge at Turner Lake Dam is through a conduit with a 3 feet diameter drop inlet or over the emergency spillway.

(2) Emergency spillway capacity at maximum pool 740 c.f.s.

c. Elevation (Feet Above M.S.L.).

(1) Top of dam - 1150.0 ±.

(2) Invert of steel pipe 1141.9 ±.

(3) Crest of drop inlet 1145.9 ±.

(4) Spillway crest 1147.5 ±.

(5) Streambed at Centerline of Dam - 1120.0 ± (Estimated).

(6) Maximum Tailwater - unknown.

d. Reservoir. Length of maximum pool - 1800 feet.

e. Storage.

(1) Normal - 154 acre-feet.

(2) Maximum - 221 acre-feet.

f. Reservoir Surface Area (Acres).

(1) Top of dam - 17.0.

(2) Drop inlet crest - 16.0.

g. Dam.

Type - earth fill.

Length - 600 feet.

Height - 32 ± feet.

Top width - 16 feet.

Side Slope -

(a) Downstream: 1V on 2H.

(b) Upstream: Unknown.

Zoning - unknown.

Impervious Core - unknown.

Cutoff - unknown.

h. Emergency Spillway.

(1) Type - Uncontrolled.

(2) Crest Elevation: 1147.50 ± feet m.s.l.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN.

No design drawings or data are known to exist except information at the Soil Conservation Service.

2.2 CONSTRUCTION. The dam was constructed in 1972. Assistance in the design of the dam was obtained from the Soil Conservation Service, U. S. Department of Agriculture, Salem, Missouri.

2.3 OPERATION.

No operating records exist.

2.4 EVALUATION.

a. Availability. There are no engineering data available except information at Soil Conservation Service.

b. Adequacy. The field surveys and visual inspections presented herein are considered adequate to support the conclusion of this report. Seepage and stability analyses comparable to the requirements of the guidelines are not on record. This is a deficiency which should be rectified.

c. Validity. Information at Soil Conservation Service is of general and advisory nature.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. The owner did not accompany the inspection team. Turner Lake is the lower lake in the watershed. The upper lake, Ziske Lake, was inspected the same day (See report on Ziske Lake).

b. Project Geology. No rock outcrops are visible at the site, however, the abutment soil contains residuum of the Tower Ordivician Roubidoux and Gasconade formations, indicating that the reservoir is underlain by Gasconade dolomite. The dam embankment is reportedly composed of soil excavated from the reservoir area.

Seepage was observed at the upper end of the lake in the abutment of Ziske Dam opposite the sillway. No other seeps or springs were observed directly upstream or downstream of Turner Dam.

c. Dam. No detrimental settlement, cracking or sinkholes were observed in or near the earth embankment.

An embankment cross-section near the maximum height for the dam is shown on Plate 3. In a few areas, the embankment slopes are considerably steeper than the section shown. It is difficult to determine the reason for the irregular slopes especially since there was heavy vegetation on the slope but it appears that the slope has experienced some sliding. There is a slide scarp in the area adjacent to the outlet pipe up from the toe of the dam where seepage is exiting from the embankment. The slides are not large but they do pose a danger of progressive failure of the embankment. No burrows were noted but some could be present and masked by vegetation.

The dam had tall grass and weeds growing on it. It provides animal habitat which increases the likelihood of animal burrows.

Based upon surface observations, the dam is composed of clay and rock.

There is no riprap on the embankment.

Marshy areas with standing water and cattails were observed on the lower portion of the embankment from the discharge pipe to roughly the center of the dam and downstream of the toe from roughly the center of the dam to near the left abutment. The

standing water indicates that a steady seepage condition exists. The seepage is greatest in the area immediately surrounding the discharge pipe which indicates that the backfill around the pipe may have been placed improperly (see photograph 11). There is some scour and erosion at the outlet of the discharge pipe.

d. Appurtenant Structures. Appurtenant structures consist of a spillway and an overflow intake structure and discharge pipe.

The spillway is approximately 16 feet wide. The spillway extends from the dam embankment down past the toe of the dam. It is composed of embankment or foundation material.

The discharge pipe extends out unsupported from the embankment for a distance of approximately 10 feet. In addition to the erosion that has taken place around the pipe, there is a large scour hole near the end of the pipe. The degree of erosion associated with the discharge pipe indicates that there are sufficient velocities to endanger the embankement.

e. Reservoir Area. No pertinent problems were noted in the reservoir area.

f. Downstream Channels. There is a drainage channel downstream of Turner Lake. It meanders through a large, broad floodplain. Any excess logs or debris in the creek could cause water to overflow the creek in times of high flow, but this should not significantly restrict flow from the spillway so as to cause overtopping of the dam.

3.2 EVALUATION. Insufficient erosion protection on the upstream face of the dam and in the spillway, the erosion of the soil from around the discharge pipe, seepage in the area of the discharge pipe, and the lack of scour protection and energy dissipator at the pipe outlet are all deficiencies which should be investigated and corrected. The heavy vegetation on the embankment should be cut and maintained to prevent it from providing an animal habitat and possible burrowing by such animals. Also, the marshy areas with standing water indicate the existence of a steady seepage condition which could be contributing to the apparent instability of the downstream embankment slope. The need for seepage-control measures and remedial measures to provide adequate stability of the downstream slope should be based upon an analysis of the stability and seepage conditions by a professional engineer experienced in the design and construction of dams.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES.

The spillway is uncontrolled; therefore, no regulating procedures exist for this structure.

4.2 MAINTENANCE OF DAM.

Little recent maintenance is apparent as evidenced by the vegetative cover, brush and small trees growing on the dam and spillway areas.

4.3 MAINTENANCE OF OPERATING FACILITIES.

Not applicable.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT.

The inspection team is not aware of any existing warning system for this dam.

4.5 EVALUATION.

Additional maintenance in the form of mowing of the slopes and crown and erosion repairs at the discharge end of the outlet pipe need to be made.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES.

a. Design Data. Design data are not available.

b. Experience Data. All of the pertinent data furnished in this report were obtained from U. S. Geological Survey 15 minute quadrangle sheets or from surveys made during the inspection.

c. Visual Observations.

(1) The lake is located immediately downstream of the Ziske Dam.

(2) The level of the lake is controlled by a conduit spillway drop inlet which is located upstream of the dam near the center. The conduit spillway consists of an approximate 3 feet diameter drop inlet and a 18 inch steel pipe through the dam at the bottom of the drop inlet the invert of the drop inlet and the 18 inch pipe are at elevations 1145.9 and 1141.9 feet m.s.l., respectively. (See Photos 8 and 9).

(3) Erosion and undermining at the end of the 18 inch pipe were observed.

(4) A grassy spillway located at the right side of the dam serves as an emergency spillway (See Plates 2 and 3 and Photos 6 and 7). Any high and sustained flows through the emergency spillway could cause excessive erosions of the embankment. The excessive erosions could threaten the safety of the dam.

(5) Drawdown facilities necessary to evacuate the lake are not provided.

d. Overtopping Potential.

The drop inlet emergency spillway cannot pass one-half of the Probable Maximum Flood (PMF) without overtopping the dam. The Probable Maximum Flood is defined as the flood discharge that may be expected from the most sever combination of critical meteorologic and hydraulic conditions that are reasonably possible in the region. The spillway will pass 20 percent of the PMF or 1 percent chance flood (100-year flood) without overtopping with the assumption of no sudden collapse of Ziske Dam upstream (the spillway of Ziske Dam will pass 15 percent of the PMF). A 1 percent flood is a flood that would have a 1 percent chance of being exceeded in any

given year. Routing the one-half PMF through the lake reveals that the dam would be overtopped for approximately 2.4 hours with a maximum 1.3 feet water and 2330 c.f.s. discharge over the low point of the dam. The tsunami wave from a sudden collapse of the Ziske Dam upstream could threaten the safety of this dam.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY.

a. Visual Observations. Visual observations of the dam, steel pipe conduit, drop inlet and spillwy are discussed and evaluated in Sections 3 and 5. The dam has no other appurtenant structures.

b. Design and Construction Data. As discussed in Section 2. Seepage and stability analyses comparable to the requirements of the guidelines are not on record. This is a deficiency which should be rectified.

c. Operating Records. No appurtenant structures requiring operation exist at this dam.

d. Post Construction Changes. No post-construction changes are known or apparent except for possible repairs to past slides for which the only evidence is a varying downstream slope along the length of the dam.

e. Seismic Stability. Turner Dam is in seismic zone 2, for which the recommended guidelines for inspection assign a "moderate" damage probability. Since neither original design analyses nor strengths of embankment or foundation materials are available, an accurate seismic analysis cannot be made.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT.

a. Safety. Several items are deficient which should be corrected. No erosion protection exists on the upstream slope of the dam. The discharge from the steel pipe conduit causes erosion. There is a slide scarp and seepage on the downstream slope. The spillway is not sufficiently protected against erosion. The spillway capacity of the dam is insufficient to pass 50 percent of the Probable Maximum Flood without overtopping the dam. Tall vegetation on the embankment could provide habitat for burrowing animals.

b. Adequacy of Information. The statements and recommendations in this report are based on visual observations and verbal discussions. Seepage and stability analyses comparable to the requirements of the guidelines are not on record. This is a deficiency which should be rectified.

c. Urgency. We recommend the remedial measures listed in Section 7.2 be accomplished in the near future. The item listed in paragraph 7.2c should be pursued on a high priority basis.

d. Need for Phase II. No Phase II inspection is recommended.

7.2 REMEDIAL MEASURES.

The following remedial measures are recommended:

a. Fill any animal burrows found during clearing of brush.

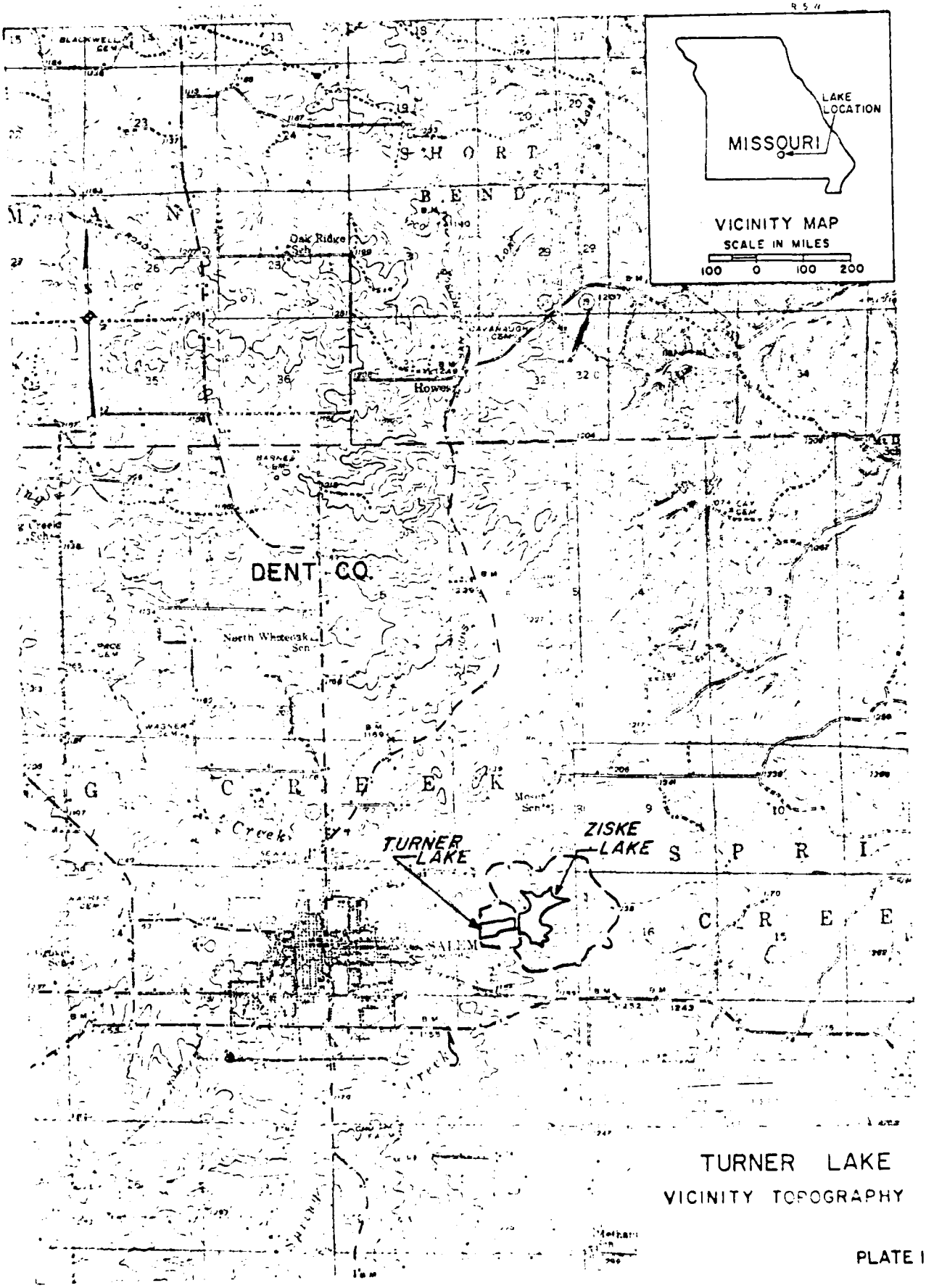
b. Establish and maintain a grass cover on the embankment by cutting the tall vegetation to prevent it from providing animal habitat and possible burrowing by such animals.

c. The spillway size and/or height of the dam should be increased to pass at least 50 percent of the Probable Maximum Flood without overtopping the dam. Adequate erosion protection and/or energy dissipator should be provided for the high flow over the spillway.

d. A stability and seepage analysis of the dam should be performed by a professional engineer experienced in the design and construction of dams. The possible seepage around the outlet works pipe and the marshy area downstream of the dam should be evaluated and considered in these analyses.

e. A detailed inspection of the dams and spillways should be made every 2 to 5 years by a professional engineer experienced in the design and construction of dams.

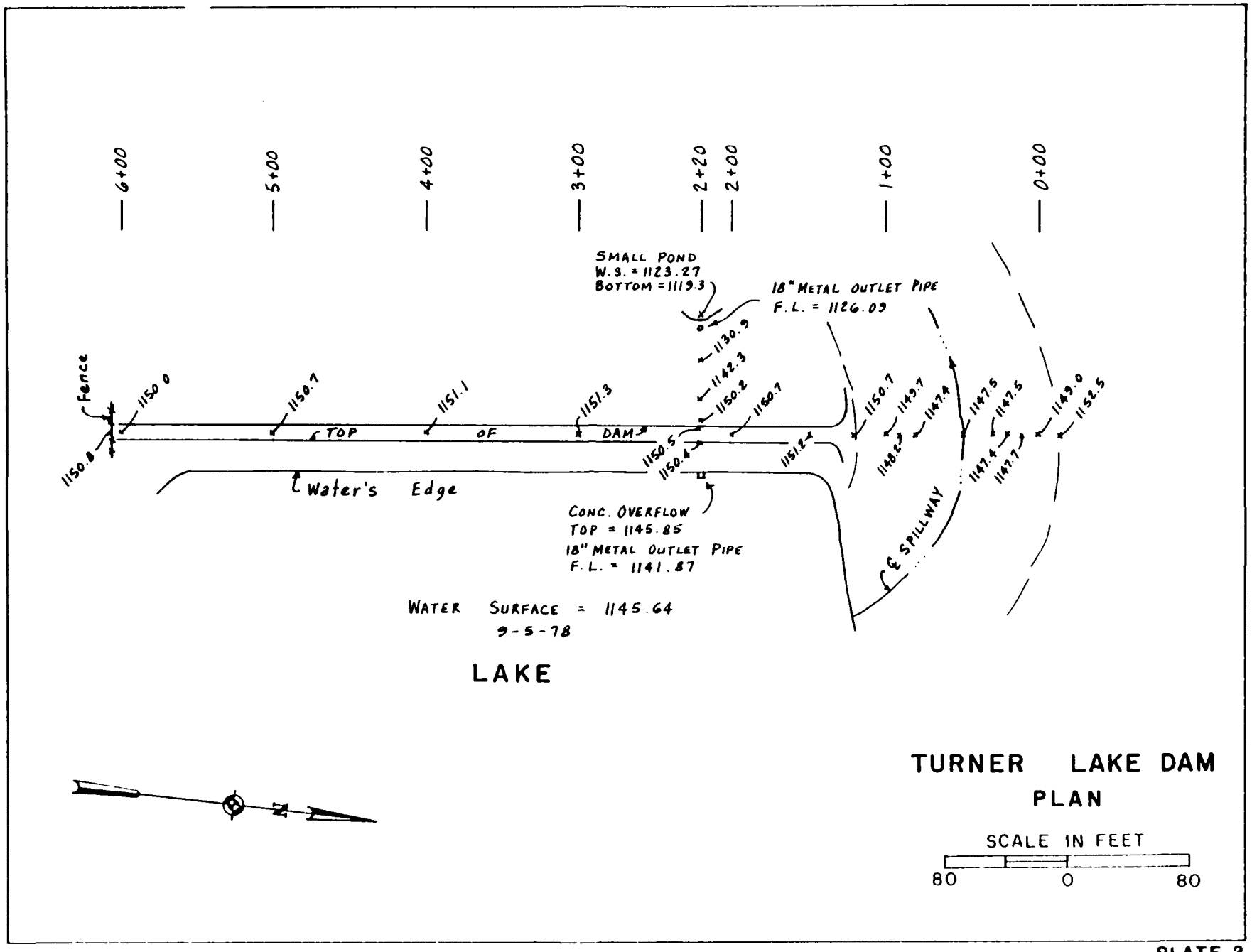
f. Erosion and undermining at the downstream end of the discharge pipe should be repaired and protected with adequate riprap and/or energy dissipator.



TURNER LAKE

VICINITY TOPOGRAPHY

PLATE I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BOTTOM = 1119.3
18" METAL OUTLET PIPE
F.L. = 1126.09
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1130.9
1142.3
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1150.7
1150.7
1149.7
1147.4
1147.5
1147.5
1149.0
1152.5
TOP OF DAM
1150.0
1150.5
1150.4
1151.2
1148.2
1147.4
1147.7
Water's Edge
CONC. OVERFLOW
TOP = 1145.85
18" METAL OUTLET PIPE
F.L. = 1141.87
℄ SPILLWAY
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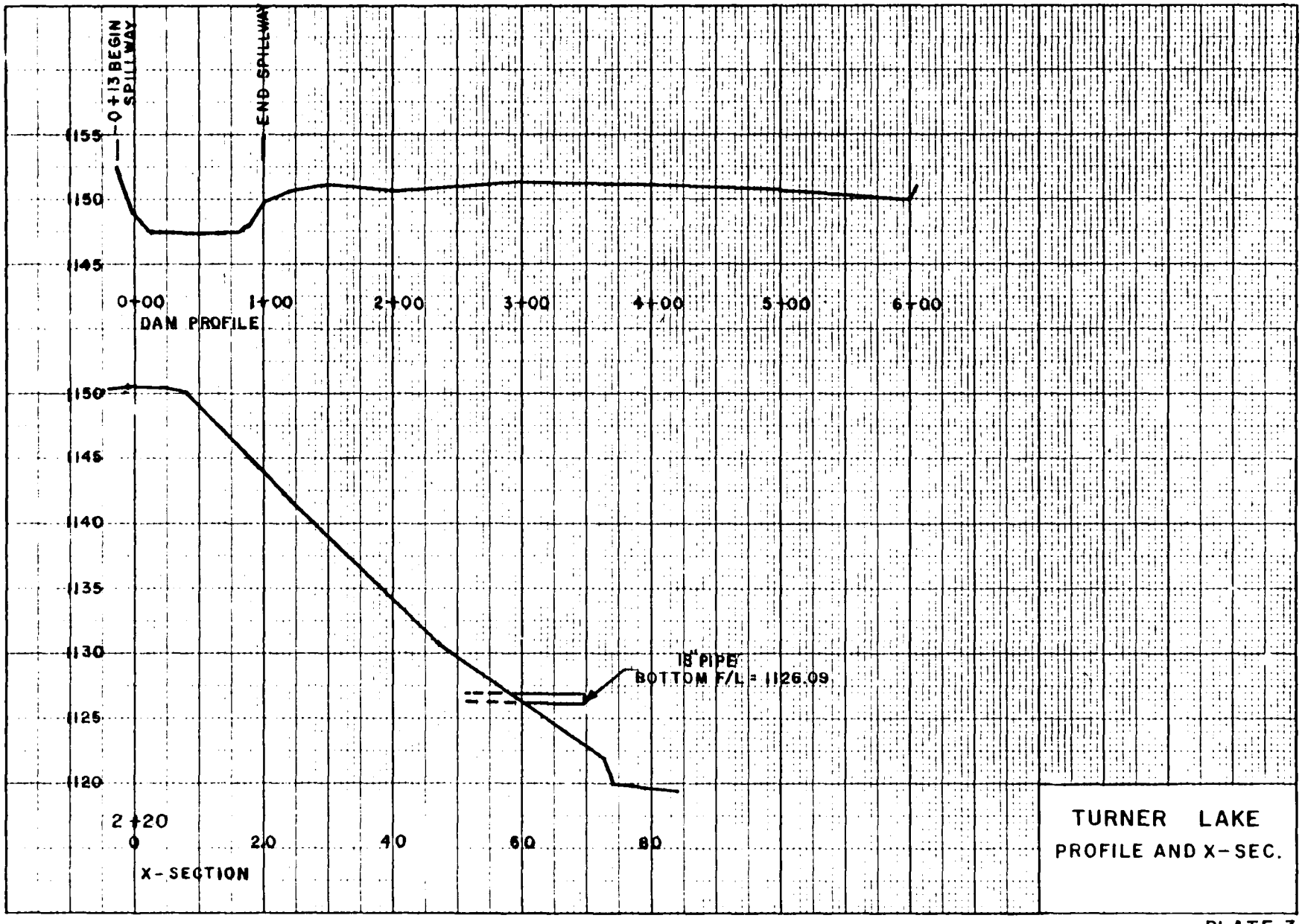
PLATE 2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TURNER LAKE
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PLATE 3

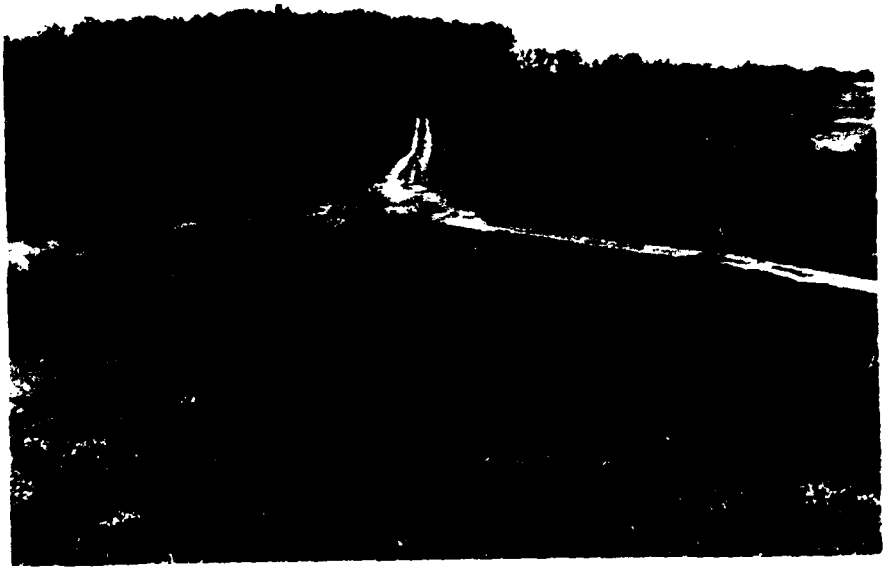

PHOTO 1 Crest of Dam

PHOTO 2 Downstream Slope of Dam Toward Right Abutment

PHOTO 3 Downstream Slope of Dam Toward Left Abutment

PHOTO 4 Upstream Center Slope of Dam and Lake

PHOTO 5 Downstream Center of Slope

PHOTO 6 Spillway

PHOTO 7 Spillway

PHOTO 8 Overflow Intake

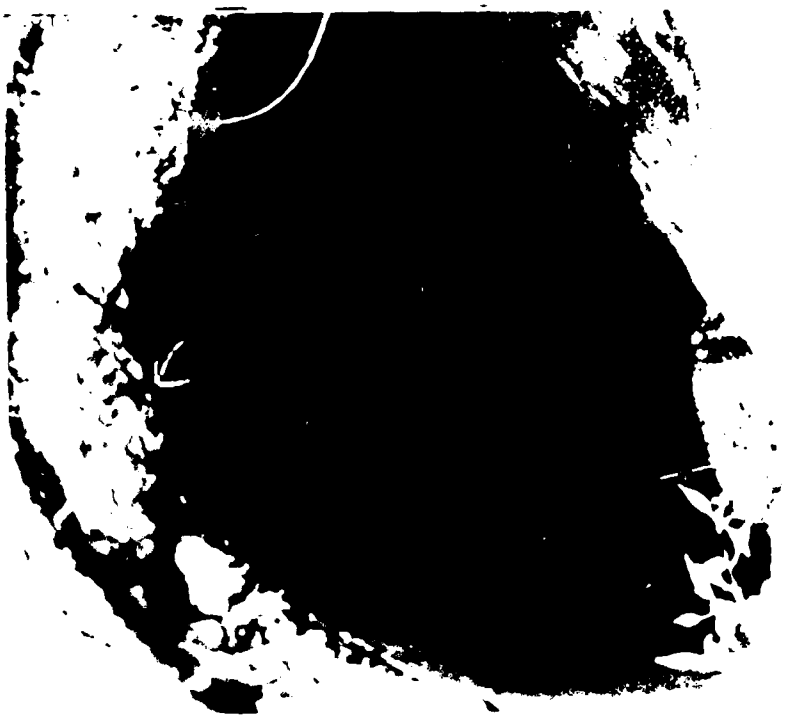

PHOTO 9 Overflow Intake - Inside Pipe

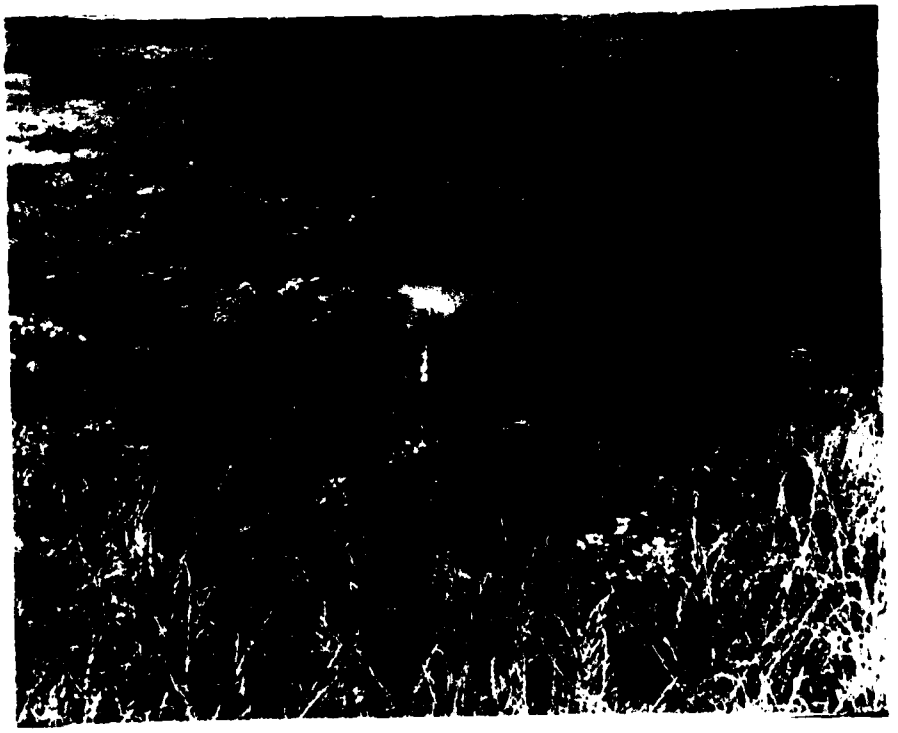

PHOTO 10 Discharge Pipe - Downstream

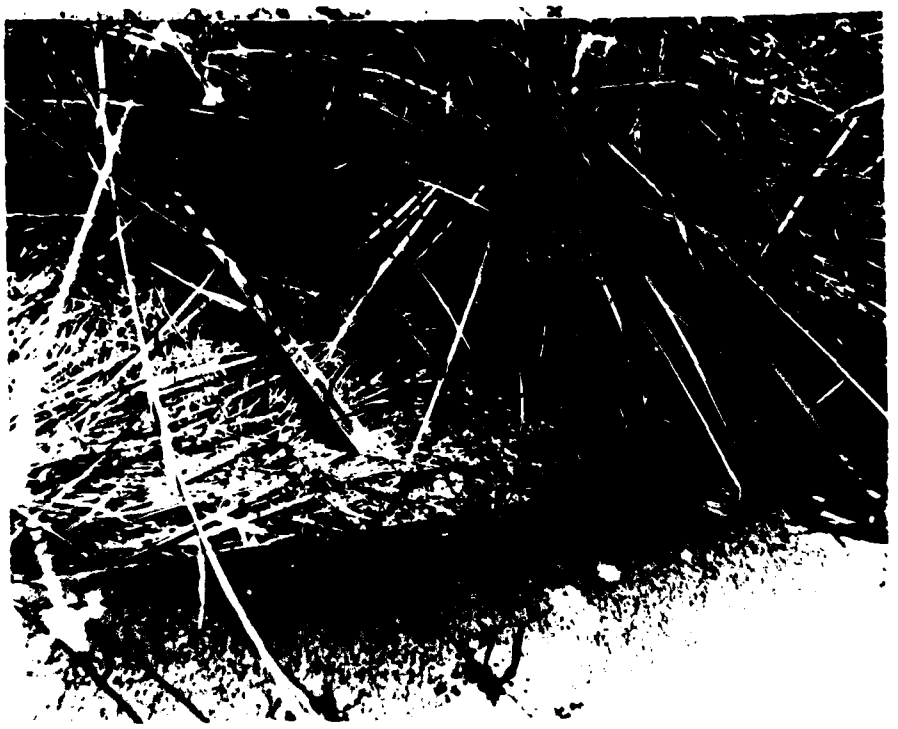

PHOTO 11 Seepage around Discharge Pipe Above Outlet

PHOTO 12 Upstream of Dam - Ziske Dam at Upper End

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation is derived and determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33." Reduction factors have not been applied. A 24-hour storm duration is assumed with the total rainfall depth distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use, and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the outlet works, spillway, and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-storage capacity curve. The hydraulic capacity of the outlet works, spillway, and top of dam are defined by elevation-discharge curves.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determines the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above methodology has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed in the attached computer printout. Definitions of these variables are contained in the "User's Manual" for the computer program.

5. Hydrologic and Hydraulic Data.

a. The capacity of the closed conduit spillway is controlled by the 18 inch pipe with inlet control.

b. Rating curves for emergency spillway and top of the dam are derived from the assumption of critical flows over the crest. A loss of 0.5 velocity head is consided for spillway flow before overtopping.

c. The result of the overtopping analyses are obtained by routing the PMF or percent PMF through the Ziske Lake and Turner Lake with the assumption of no failure of Ziske Dam upstream.

TURNER LAKE

```
1*****************   **********
 FLOOD HYDROGRAPH P   AGE (MEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  12 SEP 78
 ********************************
     1              A1         DAM INSPECTION 5 SEPTEMBER 1978
     2              A2         ZISKE DAM AND TURNER DAM SALAM MO
     3              A3         SCS HYDROGRAPHS PMP AND 1PMP
     4              B    258      0       5       0       0       0       0       0      -5       0
     5              B1     5
     6              J      1      6       1
     7              J1   1.0    .10     .15     .20     .30     .50
     8              K      0      1       0       0       1       0       1
     9              K1       CALCULATION OF INFLOW HYDROGRAPH OF ZISKE DAM
    10              M      1      2     .59       0       0       1       0       0       1
    11              P      0     26     102     121     130
    12              T      0      0       0       0       0       0      -1     -89
    13              M2     0    .18
    14              X     30     40       2
    15              K      1      2       0       0       1       0       1
    16              K1       ROUTED FLOW THROUGH EMERGENCY SPILLWAY AND TOP OF DAM
    17              Y      0      0       0       1       1
    18              Y1     1      0       0       0       0       0 -1161.0      -1
    19              Y41161.0  1163.3  1164.1    1165    1166    1167  1167.4  1167.8  1168.5  1172.6
    20              Y5     0     94     300     900    2000    4000    5000    6800   14500   44800
    21              SA     0     29      29      31      55
    22              SE  1135   1161    1162    1165    1170
    23              SS  1161
    24              SD1164.1
    25              K      0      2       0       0       1       3       1
    26              K1       CALCULATION OF INFLOW HYDROGRAPH OF TURNER DAM
    27              M      1      2     .09       0       0       1       0       0       1
    28              P      0     26     102     121     130

    29              T      0      0       0       0       0       0      -1     -89       0     .28
    30              M2     0    .02
    31              X     30     40       2
    32              K      2      2       0       0       1       3       1
    33              K1       COMBINED TWO HYDROGRAPHS
    34              K      1      3       0       0       0       0       1
    35              K1       ROUTED FLOW THROUGH EMERGENCY SPILLWAY AND TOP OF DAM
    36              Y      0      0       0       1       1
    37              Y1     1      0       0       0       0       0 -1145.9      -1
    38              Y41145.9  1147.5    1150    1151    1152    1153    1154
    39              Y5     0     20     760    1800    3700    8000   13500
    40              SA     0     16      16      17      18
    41              SE  1117  1145.9  1147.5    1150    1154
    42              SS1147.5
    43              SD  1150
    44              K     99
1                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                 RUNOFF HYDROGRAPH AT          1
                                 ROUTE HYDROGRAPH TO           2
                                 RUNOFF HYDROGRAPH AT          2
                                 COMBINE  2 HYDROGRAPHS AT     2
```

DAM INSPECTION 5 SEPTEMBER 1978
ZISKE DAM SALAM MO
SCS HYDROGRAPHS PMP AND IPMP

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	0	0	0	0	0	-5	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLOW HYDROGRAPH OF ZISKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	1	5	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.59	0.00	.59	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	26.00	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-89.00	0.00	0.00

CURVE NO = -89.00 WETNESS = -1.00 EFFECT CN = 89.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .18

RECESSION DATA
STRTQ= 30.00 QRCSN= 40.00 RTIOR= 2.00

UNIT HYDROGRAPH 15 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .18 VOL= 1.00
361. 1126. 1249. 867. 439. 244. 131. 70. 38. 21.
12. 6. 1.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	28.	1.01	12.05	145	.22	.21	.01	356.
1.01	.10	2	.01	0.00	.01	26.	1.01	12.10	146	.22	.21	.01	523.
1.01	.15	3	.01	0.00	.01	24.	1.01	12.15	147	.22	.21	.01	708.
1.01	.20	4	.01	0.00	.01	23.	1.01	12.20	148	.22	.22	.01	837.
							1.01	12.25	149	.22	.22	.01	903.

1.01	4.50	58	.01	.01	.01	29.	1.01	16.50	202	.31	.31	.00	1412.
1.01	4.55	59	.01	.01	.01	29.	1.01	16.55	203	.31	.31	.00	1411.
1.01	5.00	60	.01	.01	.01	30.	1.01	17.00	204	.31	.31	.00	1411.
1.01	5.05	61	.01	.01	.01	30.	1.01	17.05	205	.24	.24	.00	1387.
1.01	5.10	62	.01	.01	.01	30.	1.01	17.10	206	.24	.24	.00	1312.
1.01	5.15	63	.01	.01	.01	31.	1.01	17.15	207	.24	.24	.00	1229.
1.01	5.20	64	.01	.01	.01	31.	1.01	17.20	208	.24	.24	.00	1172.
1.01	5.25	65	.01	.01	.01	32.	1.01	17.25	209	.24	.24	.00	1145.
1.01	5.30	66	.01	.01	.01	32.	1.01	17.30	210	.24	.24	.00	1127.
1.01	5.35	67	.01	.01	.01	32.	1.01	17.35	211	.24	.24	.00	1118.
1.01	5.40	68	.01	.01	.01	33.	1.01	17.40	212	.24	.24	.00	1114.
1.01	5.45	69	.01	.01	.01	33.	1.01	17.45	213	.24	.24	.00	1111.
1.01	5.50	70	.01	.01	.01	33.	1.01	17.50	214	.24	.24	.00	1110.
1.01	5.55	71	.01	.01	.01	34.	1.01	17.55	215	.24	.24	.00	1109.
1.01	6.00	72	.01	.01	.01	34.	1.01	18.00	216	.24	.24	.00	1109.
1.01	6.05	73	.07	.04	.03	47.	1.01	18.05	217	.02	.02	.00	1028.
1.01	6.10	74	.07	.04	.03	85.	1.01	18.10	218	.02	.02	.00	777.
1.01	6.15	75	.07	.04	.02	130.	1.01	18.15	219	.02	.02	.00	498.
1.01	6.20	76	.07	.05	.02	164.	1.01	18.20	220	.02	.02	.00	304.
1.01	6.25	77	.07	.05	.02	185.	1.01	18.25	221	.02	.02	.00	206.
1.01	6.30	78	.07	.05	.02	199.	1.01	18.30	222	.02	.02	.00	151.
1.01	6.35	79	.07	.05	.02	209.	1.01	18.35	223	.02	.02	.00	122.
1.01	6.40	80	.07	.05	.02	217.	1.01	18.40	224	.02	.02	.00	107.
1.01	6.45	81	.07	.05	.02	224.	1.01	18.45	225	.02	.02	.00	98.
1.01	6.50	82	.07	.05	.02	230.	1.01	18.50	226	.02	.02	.00	93.
1.01	6.55	83	.07	.05	.01	235.	1.01	18.55	227	.02	.02	.00	91.
1.01	7.00	84	.07	.05	.01	239.	1.01	19.00	228	.02	.02	.00	89.
1.01	7.05	85	.07	.06	.01	243.	1.01	19.05	229	.02	.02	.00	89.
1.01	7.10	86	.07	.06	.01	246.	1.01	19.10	230	.02	.02	.00	89.
1.01	7.15	87	.07	.06	.01	250.	1.01	19.15	231	.02	.02	.00	89.
1.01	7.20	88	.07	.06	.01	253.	1.01	19.20	232	.02	.02	.00	89.
1.01	7.25	89	.07	.06	.01	256.	1.01	19.25	233	.02	.02	.00	89.
1.01	7.30	90	.07	.06	.01	258.	1.01	19.30	234	.02	.02	.00	89.
1.01	7.35	91	.07	.06	.01	261.	1.01	19.35	235	.02	.02	.00	89.
1.01	7.40	92	.07	.06	.01	263.	1.01	19.40	236	.02	.02	.00	89.
1.01	7.45	93	.07	.06	.01	265.	1.01	19.45	237	.02	.02	.00	89.
1.01	7.50	94	.07	.06	.01	267.	1.01	19.50	238	.02	.02	.00	89.
1.01	7.55	95	.07	.06	.01	269.	1.01	19.55	239	.02	.02	.00	89.
1.01	8.00	96	.07	.06	.01	271.	1.01	20.00	240	.02	.02	.00	89.
1.01	8.05	97	.07	.06	.01	273.	1.01	20.05	241	.02	.02	.00	89.
1.01	8.10	98	.07	.06	.01	274.	1.01	20.10	242	.02	.02	.00	89.
1.01	8.15	99	.07	.06	.01	276.	1.01	20.15	243	.02	.02	.00	89.
1.01	8.20	100	.07	.06	.01	277.	1.01	20.20	244	.02	.02	.00	89.
1.01	8.25	101	.07	.06	.01	278.	1.01	20.25	245	.02	.02	.00	89.
1.01	8.30	102	.07	.06	.01	280.	1.01	20.30	246	.02	.02	.00	89.
1.01	8.35	103	.07	.06	.01	281.	1.01	20.35	247	.02	.02	.00	89.
1.01	8.40	104	.07	.06	.01	282.	1.01	20.40	248	.02	.02	.00	89.
1.01	8.45	105	.07	.06	.01	283.	1.01	20.45	249	.02	.02	.00	89.
1.01	8.50	106	.07	.06	.01	284.	1.01	20.50	250	.02	.02	.00	89.
1.01	8.55	107	.07	.06	.01	285.	1.01	20.55	251	.02	.02	.00	89.
1.01	9.00	108	.07	.06	.01	286.	1.01	21.00	252	.02	.02	.00	89.
1.01	9.05	109	.07	.06	.01	287.	1.01	21.05	253	.02	.02	.00	89.
1.01	9.10	110	.07	.06	.01	288.	1.01	21.10	254	.02	.02	.00	89.
1.01	9.15	111	.07	.06	.01	289.	1.01	21.15	255	.02	.02	.00	89.
1.01	9.20	112	.07	.06	.00	289.	1.01	21.20	256	.02	.02	.00	89.
1.01	9.25	113	.07	.06	.00	290.	1.01	21.25	257	.02	.02	.00	89.
1.01	9.30	114	.07	.06	.00	291.	1.01	21.30	258	.02	.02	.00	89.
1.01	9.35	115	.07	.06	.00	291.	1.01	21.35	259	.02	.02	.00	89.

1.01	8.	105	.07	.06	.01	283.	1.01	20.45	249	.02	.02	.00	9.
1.01	8.5	106	.07	.06	.01	284.	1.01	20.50	250	.02	.02	.00	9.
1.01	8.55	107	.07	.06	.01	285.	1.01	20.55	251	.02	.02	.00	89.
1.01	9.00	108	.07	.06	.01	286.	1.01	21.00	252	.02	.02	.00	89.
1.01	9.05	109	.07	.06	.01	287.	1.01	21.05	253	.02	.02	.00	89.
1.01	9.10	110	.07	.06	.01	288.	1.01	21.10	254	.02	.02	.00	89.
1.01	9.15	111	.07	.06	.01	289.	1.01	21.15	255	.02	.02	.00	89.
1.01	9.20	112	.07	.06	.00	289.	1.01	21.20	256	.02	.02	.00	89.
1.01	9.25	113	.07	.06	.00	290.	1.01	21.25	257	.02	.02	.00	89.
1.01	9.30	114	.07	.06	.00	291.	1.01	21.30	258	.02	.02	.00	89.
1.01	9.35	115	.07	.06	.00	291.	1.01	21.35	259	.02	.02	.00	89.
1.01	9.40	116	.07	.06	.00	292.	1.01	21.40	260	.02	.02	.00	89.
1.01	9.45	117	.07	.06	.00	293.	1.01	21.45	261	.02	.02	.00	89.
1.01	9.50	118	.07	.06	.00	293.	1.01	21.50	262	.02	.02	.00	89.
1.01	9.55	119	.07	.06	.00	294.	1.01	21.55	263	.02	.02	.00	89.
1.01	10.00	120	.07	.06	.00	294.	1.01	22.00	264	.02	.02	.00	89.
1.01	10.05	121	.07	.06	.00	295.	1.01	22.05	265	.02	.02	.00	89.
1.01	10.10	122	.07	.06	.00	295.	1.01	22.10	266	.02	.02	.00	89.
1.01	10.15	123	.07	.07	.00	296.	1.01	22.15	267	.02	.02	.00	89.
1.01	10.20	124	.07	.07	.00	296.	1.01	22.20	268	.02	.02	.00	89.
1.01	10.25	125	.07	.07	.00	297.	1.01	22.25	269	.02	.02	.00	89.
1.01	10.30	126	.07	.07	.00	297.	1.01	22.30	270	.02	.02	.00	89.
1.01	10.35	127	.07	.07	.00	297.	1.01	22.35	271	.02	.02	.00	89.
1.01	10.40	128	.07	.07	.00	298.	1.01	22.40	272	.02	.02	.00	89.
1.01	10.45	129	.07	.07	.00	298.	1.01	22.45	273	.02	.02	.00	89.
1.01	10.50	130	.07	.07	.00	299.	1.01	22.50	274	.02	.02	.00	89.
1.01	10.55	131	.07	.07	.00	299.	1.01	22.55	275	.02	.02	.00	89.
1.01	11.00	132	.07	.07	.00	299.	1.01	23.00	276	.02	.02	.00	89.
1.01	11.05	133	.07	.07	.00	300.	1.01	23.05	277	.02	.02	.00	89.
1.01	11.10	134	.07	.07	.00	300.	1.01	23.10	278	.02	.02	.00	89.
1.01	11.15	135	.07	.07	.00	300.	1.01	23.15	279	.02	.02	.00	89.
1.01	11.20	136	.07	.07	.00	301.	1.01	23.20	280	.02	.02	.00	89.
1.01	11.25	137	.07	.07	.00	301.	1.01	23.25	281	.02	.02	.00	89.
1.01	11.30	138	.07	.07	.00	301.	1.01	23.30	282	.02	.02	.00	89.
1.01	11.35	139	.07	.07	.00	301.	1.01	23.35	283	.02	.02	.00	89.
1.01	11.40	140	.07	.07	.00	302.	1.01	23.40	284	.02	.02	.00	89.
1.01	11.45	141	.07	.07	.00	302.	1.01	23.45	285	.02	.02	.00	89.
1.01	11.50	142	.07	.07	.00	302.	1.01	23.50	286	.02	.02	.00	89.
1.01	11.55	143	.07	.07	.00	302.	1.01	23.55	287	.02	.02	.00	89.
1.01	12.00	144	.07	.07	.00	303.	1.02	0.00	288	.02	.02	.00	89.
									SUM	33.80	32.36	1.44	147979.
										(859.)(	822.)(	37.)(	4190.30)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7050.	1655.	514.	514.	147920.
CMS	200.	47.	15.	15.	4189.
INCHES		26.09	32.39	32.39	32.39
MM		662.71	822.75	822.75	822.75
AC-FT		821.	1019.	1019.	1019.
THOUS CU M		1012.	1257.	1257.	1257.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLOW HYDROGRAPH OF TURNER DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	0	0	0	1	3	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.09	0.00	.09	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	26.00	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-89.00	0.00	.28

CURVE NO = -89.00 WETNESS = -1.00 EFFECT CN = 89.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .02

RECESSION DATA

STRTQ= 30.00 QRCSN= 40.00 RTIOR= 2.00

TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

UNIT HYDROGRAPH 5 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .02 VOL= 1.00

518. 145. 28. 6. 0.

0

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	.00	.01	30.	1.01	12.05	145	.22	.22	.00	124.
1.01	.10	2	.01	.00	.01	29.	1.01	12.10	146	.22	.22	.00	146.
1.01	.15	3	.01	.00	.01	27.	1.01	12.15	147	.22	.22	.00	150.
1.01	.20	4	.01	.00	.01	25.	1.01	12.20	148	.22	.22	.00	151.
1.01	.25	5	.01	.00	.01	24.	1.01	12.25	149	.22	.22	.00	151.
1.01	.30	6	.01	.00	.01	22.	1.01	12.30	150	.22	.22	.00	151.
1.01	.35	7	.01	.00	.01	21.	1.01	12.35	151	.22	.22	.00	151.
1.01	.40	8	.01	.00	.01	20.	1.01	12.40	152	.22	.22	.00	152.
1.01	.45	9	.01	.00	.01	19.	1.01	12.45	153	.22	.22	.00	152.
1.01	.50	10	.01	.00	.01	18.	1.01	12.50	154	.22	.22	.00	152.
1.01	.55	11	.01	.00	.01	17.	1.01	12.55	155	.22	.22	.00	152.
1.01	1.00	12	.01	.00	.01	16.	1.01	13.00	156	.22	.22	.00	152.
1.01	1.05	13	.01	.00	.01	15.	1.01	13.05	157	.27	.26	.00	175.
1.01	1.10	14	.01	.00	.01	14.	1.01	13.10	158	.27	.26	.00	181.
1.01	1.15	15	.01	.00	.01	13.	1.01	13.15	159	.27	.26	.00	182.
1.01	1.20	16	.01	.00	.01	12.	1.01	13.20	160	.27	.26	.00	183.
1.01	1.25	17	.01	.00	.01	12.	1.01	13.25	161	.27	.26	.00	183.
1.01	1.30	18	.01	.00	.01	11.	1.01	13.30	162	.27	.26	.00	183.
1.01	1.35	19	.01	.00	.01	11.	1.01	13.35	163	.27	.26	.00	183.
1.01	1.40	20	.01	.00	.01	10.	1.01	13.40	164	.27	.26	.00	183.

1.01	1.40	20	.01	.00	.01	10.	1.01	13.40	164	.27	.26	.00	
1.01	1.45	21	.01	.00	.01	10.	1.01	13.45	165	.27	.26	.00	
1.01	1.50	22	.01	.00	.01	9.	1.01	13.50	166	.27	.26	.00	183.
1.01	1.55	23	.01	.00	.01	9.	1.01	13.55	167	.27	.26	.00	183.
1.01	2.00	24	.01	.00	.01	9.	1.01	14.00	168	.27	.26	.00	183.
1.01	2.05	25	.01	.00	.01	8.	1.01	14.05	169	.33	.33	.00	218.
1.01	2.10	26	.01	.00	.01	8.	1.01	14.10	170	.33	.33	.00	227.
1.01	2.15	27	.01	.00	.01	8.	1.01	14.15	171	.33	.33	.00	229.
1.01	2.20	28	.01	.01	.01	8.	1.01	14.20	172	.33	.33	.00	230.
1.01	2.25	29	.01	.01	.01	8.	1.01	14.25	173	.33	.33	.00	230.
1.01	2.30	30	.01	.01	.01	7.	1.01	14.30	174	.33	.33	.00	230.
1.01	2.35	31	.01	.01	.01	7.	1.01	14.35	175	.33	.33	.00	230.
1.01	2.40	32	.01	.01	.01	7.	1.01	14.40	176	.33	.33	.00	230.
1.01	2.45	33	.01	.01	.01	7.	1.01	14.45	177	.33	.33	.00	230.
1.01	2.50	34	.01	.01	.01	7.	1.01	14.50	178	.33	.33	.00	230.
1.01	2.55	35	.01	.01	.01	7.	1.01	14.55	179	.33	.33	.00	230.
1.01	3.00	36	.01	.01	.01	7.	1.01	15.00	180	.33	.33	.00	230.
1.01	3.05	37	.01	.01	.01	7.	1.01	15.05	181	.20	.20	.00	163.
1.01	3.10	38	.01	.01	.01	7.	1.01	15.10	182	.40	.40	.00	248.
1.01	3.15	39	.01	.01	.01	7.	1.01	15.15	183	.40	.40	.00	274.
1.01	3.20	40	.01	.01	.01	6.	1.01	15.20	184	.60	.60	.00	385.
1.01	3.25	41	.01	.01	.01	6.	1.01	15.25	185	.71	.70	.00	465.
1.01	3.30	42	.01	.01	.01	6.	1.01	15.30	186	1.71	1.71	.00	1005.
1.01	3.35	43	.01	.01	.01	6.	1.01	15.35	187	2.82	2.82	.01	1728.
1.01	3.40	44	.01	.01	.01	6.	1.01	15.40	188	1.11	1.11	.00	1033.
1.01	3.45	45	.01	.01	.01	6.	1.01	15.45	189	.71	.70	.00	615.
1.01	3.50	46	.01	.01	.01	6.	1.01	15.50	190	.60	.60	.00	462.
1.01	3.55	47	.01	.01	.01	6.	1.01	15.55	191	.40	.40	.00	322.
1.01	4.00	48	.01	.01	.01	6.	1.01	16.00	192	.40	.40	.00	268.
1.01	4.05	49	.01	.01	.01	6.	1.01	16.05	193	.31	.31	.00	233.
1.01	4.10	50	.01	.01	.01	6.	1.01	16.10	194	.31	.31	.00	218.
1.01	4.15	51	.01	.01	.01	6.	1.01	16.15	195	.31	.31	.00	216.
1.01	4.20	52	.01	.01	.01	6.	1.01	16.20	196	.31	.31	.00	215.
1.01	4.25	53	.01	.01	.01	6.	1.01	16.25	197	.31	.31	.00	215.
1.01	4.30	54	.01	.01	.01	6.	1.01	16.30	198	.31	.31	.00	215.
1.01	4.35	55	.01	.01	.00	6.	1.01	16.35	199	.31	.31	.00	215.
1.01	4.40	56	.01	.01	.00	6.	1.01	16.40	200	.31	.31	.00	215.
1.01	4.45	57	.01	.01	.00	6.	1.01	16.45	201	.31	.31	.00	215.
1.01	4.50	58	.01	.01	.00	6.	1.01	16.50	202	.31	.31	.00	215.
1.01	4.55	59	.01	.01	.00	6.	1.01	16.55	203	.31	.31	.00	215.
1.01	5.00	60	.01	.01	.00	6.	1.01	17.00	204	.31	.31	.00	215.
1.01	5.05	61	.01	.01	.00	6.	1.01	17.05	205	.24	.24	.00	181.
1.01	5.10	62	.01	.01	.00	6.	1.01	17.10	206	.24	.24	.00	171.
1.01	5.15	63	.01	.01	.00	6.	1.01	17.15	207	.24	.24	.00	170.
1.01	5.20	64	.01	.01	.00	6.	1.01	17.20	208	.24	.24	.00	169.
1.01	5.25	65	.01	.01	.00	6.	1.01	17.25	209	.24	.24	.00	169.
1.01	5.30	66	.01	.01	.00	6.	1.01	17.30	210	.24	.24	.00	169.
1.01	5.35	67	.01	.01	.00	6.	1.01	17.35	211	.24	.24	.00	169.
1.01	5.40	68	.01	.01	.00	6.	1.01	17.40	212	.24	.24	.00	169.
1.01	5.45	69	.01	.01	.00	6.	1.01	17.45	213	.24	.24	.00	169.
1.01	5.50	70	.01	.01	.00	6.	1.01	17.50	214	.24	.24	.00	169.
1.01	5.55	71	.01	.01	.00	7.	1.01	17.55	215	.24	.24	.00	169.
1.01	6.00	72	.01	.01	.00	7.	1.01	18.00	216	.24	.24	.00	169.
1.01	6.05	73	.07	.05	.02	27.	1.01	18.05	217	.02	.02	.00	54.
1.01	6.10	74	.07	.05	.02	34.	1.01	18.10	218	.02	.02	.00	38.

1.01	[illegible]	74	.07	.05	.02	34.	1.01	18.10	218	.02	.02	.00	16.
1.01	6.15	75	.07	.05	.02	36.	1.01	18.15	219	.02	.02	.00	16.
1.01	6.20	76	.07	.05	.02	36.	1.01	18.20	220	.02	.02	.00	15.
1.01	6.25	77	.07	.05	.02	37.	1.01	18.25	221	.02	.02	.00	15.
1.01	6.30	78	.07	.05	.01	38.	1.01	18.30	222	.02	.02	.00	15.
1.01	6.35	79	.07	.06	.01	38.	1.01	18.35	223	.02	.02	.00	15.
1.01	6.40	80	.07	.06	.01	39.	1.01	18.40	224	.02	.02	.00	15.
1.01	6.45	81	.07	.06	.01	39.	1.01	18.45	225	.02	.02	.00	15.
1.01	6.50	82	.07	.06	.01	40.	1.01	18.50	226	.02	.02	.00	15.
1.01	6.55	83	.07	.06	.01	40.	1.01	18.55	227	.02	.02	.00	15.
1.01	7.00	84	.07	.06	.01	41.	1.01	19.00	228	.02	.02	.00	15.
1.01	7.05	85	.07	.06	.01	41.	1.01	19.05	229	.02	.02	.00	15.
1.01	7.10	86	.07	.06	.01	41.	1.01	19.10	230	.02	.02	.00	15.
1.01	7.15	87	.07	.06	.01	42.	1.01	19.15	231	.02	.02	.00	15.
1.01	7.20	88	.07	.06	.01	42.	1.01	19.20	232	.02	.02	.00	15.
1.01	7.25	89	.07	.06	.01	42.	1.01	19.25	233	.02	.02	.00	14.
1.01	7.30	90	.07	.06	.01	42.	1.01	19.30	234	.02	.02	.00	14.
1.01	7.35	91	.07	.06	.01	43.	1.01	19.35	235	.02	.02	.00	14.
1.01	7.40	92	.07	.06	.01	43.	1.01	19.40	236	.02	.02	.00	14.
1.01	7.45	93	.07	.06	.01	43.	1.01	19.45	237	.02	.02	.00	14.
1.01	7.50	94	.07	.06	.01	43.	1.01	19.50	238	.02	.02	.00	14.
1.01	7.55	95	.07	.06	.01	43.	1.01	19.55	239	.02	.02	.00	14.
1.01	8.00	96	.07	.06	.01	44.	1.01	20.00	240	.02	.02	.00	14.
1.01	8.05	97	.07	.06	.01	44.	1.01	20.05	241	.02	.02	.00	14.
1.01	8.10	98	.07	.06	.01	44.	1.01	20.10	242	.02	.02	.00	14.
1.01	8.15	99	.07	.06	.01	44.	1.01	20.15	243	.02	.02	.00	14.
1.01	8.20	100	.07	.06	.01	44.	1.01	20.20	244	.02	.02	.00	14.
1.01	8.25	101	.07	.06	.01	44.	1.01	20.25	245	.02	.02	.00	14.
1.01	8.30	102	.07	.06	.00	44.	1.01	20.30	246	.02	.02	.00	14.
1.01	8.35	103	.07	.06	.00	45.	1.01	20.35	247	.02	.02	.00	14.
1.01	8.40	104	.07	.06	.00	45.	1.01	20.40	248	.02	.02	.00	14.
1.01	8.45	105	.07	.06	.00	45.	1.01	20.45	249	.02	.02	.00	14.
1.01	8.50	106	.07	.06	.00	45.	1.01	20.50	250	.02	.02	.00	14.
1.01	8.55	107	.07	.06	.00	45.	1.01	20.55	251	.02	.02	.00	14.
1.01	9.00	108	.07	.06	.00	45.	1.01	21.00	252	.02	.02	.00	14.
1.01	9.05	109	.07	.06	.00	45.	1.01	21.05	253	.02	.02	.00	14.
1.01	9.10	110	.07	.06	.00	45.	1.01	21.10	254	.02	.02	.00	14.
1.01	9.15	111	.07	.06	.00	45.	1.01	21.15	255	.02	.02	.00	14.
1.01	9.20	112	.07	.07	.00	45.	1.01	21.20	256	.02	.02	.00	14.
1.01	9.25	113	.07	.07	.00	45.	1.01	21.25	257	.02	.02	.00	14.
1.01	9.30	114	.07	.07	.00	45.	1.01	21.30	258	.02	.02	.00	14.
1.01	9.35	115	.07	.07	.00	46.	1.01	21.35	259	.02	.02	.00	14.
1.01	9.40	116	.07	.07	.00	46.	1.01	21.40	260	.02	.02	.00	14.
1.01	9.45	117	.07	.07	.00	46.	1.01	21.45	261	.02	.02	.00	14.
1.01	9.50	118	.07	.07	.00	46.	1.01	21.50	262	.02	.02	.00	14.
1.01	9.55	119	.07	.07	.00	46.	1.01	21.55	263	.02	.02	.00	14.
1.01	10.00	120	.07	.07	.00	46.	1.01	22.00	264	.02	.02	.00	14.
1.01	10.05	121	.07	.07	.00	46.	1.01	22.05	265	.02	.02	.00	14.
1.01	10.10	122	.07	.07	.00	46.	1.01	22.10	266	.02	.02	.00	14.
1.01	10.15	123	.07	.07	.00	46.	1.01	22.15	267	.02	.02	.00	14.
1.01	10.20	124	.07	.07	.00	46.	1.01	22.20	268	.02	.02	.00	14.
1.01	10.25	125	.07	.07	.00	46.	1.01	22.25	269	.02	.02	.00	14.
1.01	10.30	126	.07	.07	.00	46.	1.01	22.30	270	.02	.02	.00	14.
1.01	10.35	127	.07	.07	.00	46.	1.01	22.35	271	.02	.02	.00	14.

1.01	10.	129	.07	.07	.00	46.	1.01	22.40	272	.02	.02	.00	14.
1.01	10.05	129	.07	.07	.00	46.	1.01	22.45	273	.02	.02	.00	14.
1.01	10.50	130	.07	.07	.00	46.	1.01	22.50	274	.02	.02	.00	14.
1.01	10.55	131	.07	.07	.00	46.	1.01	22.55	275	.02	.02	.00	14.
1.01	11.00	132	.07	.07	.00	46.	1.01	23.00	276	.02	.02	.00	14.
1.01	11.05	133	.07	.07	.00	46.	1.01	23.05	277	.02	.02	.00	14.
1.01	11.10	134	.07	.07	.00	46.	1.01	23.10	278	.02	.02	.00	14.
1.01	11.15	135	.07	.07	.00	46.	1.01	23.15	279	.02	.02	.00	14.
1.01	11.20	136	.07	.07	.00	46.	1.01	23.20	280	.02	.02	.00	14.
1.01	11.25	137	.07	.07	.00	46.	1.01	23.25	281	.02	.02	.00	14.
1.01	11.30	138	.07	.07	.00	47.	1.01	23.30	282	.02	.02	.00	14.
1.01	11.35	139	.07	.07	.00	47.	1.01	23.35	283	.02	.02	.00	14.
1.01	11.40	140	.07	.07	.00	47.	1.01	23.40	284	.02	.02	.00	14.
1.01	11.45	141	.07	.07	.00	47.	1.01	23.45	285	.02	.02	.00	14.
1.01	11.50	142	.07	.07	.00	47.	1.01	23.50	286	.02	.02	.00	14.
1.01	11.55	143	.07	.07	.00	47.	1.01	23.55	287	.02	.02	.00	14.
1.01	12.00	144	.07	.07	.00	47.	1.02	0.00	288	.02	.02	.00	14.
									SUM	33.80	32.76	1.04	23411.
										(859.)	(832.)	(26.)	(662.93)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1728.	254.	81.	81.	23374.
CMS	49.	7.	2.	2.	662.
INCHES		26.29	33.55	33.55	33.55
MM		667.69	852.28	852.28	852.28
AC-FT		120.	161.	161.	161.
THOUS CU M		150.	199.	199.	199.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1728.	254.	81.	81.	23374.
CMS	49.	7.	2.	2.	662.
INCHES		26.29	33.55	33.55	33.55
MM		667.69	852.28	852.28	852.28
AC-FT		120.	161.	161.	161.
THOUS CU M		150.	199.	199.	199.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	173.	25.	8.	8.	2337.
CMS	5.	1.	0.	0.	66.
INCHES		2.63	3.36	3.36	3.36
MM		66.77	85.23	85.23	85.23
AC-FT		13.	16.	16.	16.
THOUS CU M		16.	20.	20.	20.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 3

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>W 150
>P *
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ISTAQ	ICOPT	IICOE	ITAPE	JPLT	JPRT	IHAPE	ISTAGE	IAUTO
2	2	0	0	1	1	1	0	0

SUB-01 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 1

30.	29.	28.	26.	25.	24.	23.	21.	20.	20.
19.	18.	17.	16.	16.	15.	14.	14.	13.	13.
13.	12.	12.	12.	12.	11.	11.	11.	11.	11.
11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	11.	11.	12.	12.	12.	12.	12.	12.	12.
13.	13.	13.	13.	13.	14.	14.	14.	14.	14.
15.	15.	15.	15.	16.	16.	16.	16.	17.	17.
17.	17.	38.	45.	48.	50.	53.	55.	57.	60.
62.	64.	67.	69.	72.	74.	76.	79.	81.	84.
86.	87.	91.	93.	95.	97.	100.	102.	104.	106.
108.	111.	113.	115.	117.	119.	121.	123.	125.	127.
129.	131.	133.	135.	137.	139.	149.	160.	170.	180.
189.	198.	206.	214.	222.	229.	235.	241.	247.	253.
258.	263.	268.	272.	277.	281.	285.	288.	292.	295.
298.	301.	303.	306.	387.	419.	443.	500.	573.	643.
706.	765.	815.	860.	898.	932.	965.	1022.	1056.	1097.
1151.	1196.	1233.	1264.	1288.	1308.	1323.	1336.	1383.	1413.
1448.	1489.	1531.	1568.	1600.	1627.	1649.	1667.	1681.	1692.
1629.	1705.	1722.	1854.	2018.	2747.	4013.	4532.	5438.	6241.
5719.	4949.	4233.	3673.	3162.	2736.	2406.	2184.	2075.	1983.
1909.	1849.	1802.	1764.	1698.	1652.	1605.	1554.	1505.	1462.
1425.	1395.	1371.	1351.	1333.	1323.	1189.	1123.	1023.	906.
820.	734.	653.	580.	515.	458.	409.	366.	328.	308.
298.	284.	273.	263.	254.	245.	237.	229.	222.	215.
209.	203.	197.	192.	187.	182.	177.	173.	169.	165.
162.	158.	155.	152.	149.	146.	144.	142.	139.	137.
135.	133.	132.	130.	128.	127.	125.	124.	123.	122.
121.	120.	119.	118.	117.	116.	115.	114.	114.	113.
112.	112.	111.	111.	110.	110.	109.	109.		

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6241.	1858.	561.	561.	1015536.
CMS	177.	53.	16.	16.	4574.
INCHES		25.42	30.69	30.69	30.69
MM		645.60	779.56	779.56	779.56
AC-FT		921.	1113.	1113.	1113.
THOUS CU M		1136.	1372.	1372.	1372.

SURFACE AREA=	0.	16.	16.	17.	18.
CAPACITY=	0.	154.	180.	221.	291.
ELEVATION=					

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>Q
>BYE
JOB PROCESSING COMPLETED      0.524
YE  78/09/15. 09.03.07.
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PEAK FL AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .10	RATIO 3 .15	RATIO 4 .20	RATIO 5 .30	RATIO 6 .50
HYDROGRAPH AT	1	.59	1	7050.	705.	1057.	1410.	2115.	3525.
		(1.53)		(199.62)(	19.96)(	29.94)(	39.92)(	59.89)(	99.81)(
ROUTED TO	2	.59	1	5779.	92.	247.	561.	1183.	2352.
		(1.53)		(163.64)(	2.60)(	7.00)(	15.88)(	33.50)(	66.59)(
HYDROGRAPH AT	2	.09	1	1728.	173.	259.	346.	518.	864.
		(.23)		(48.93)(	4.89)(	7.34)(	9.79)(	14.66)(	24.47)(
2 COMBINED	2	.68	1	6241.	227.	340.	610.	1278.	2513.
		(1.76)		(176.72)(	6.43)(	9.64)(	17.27)(	36.19)(	71.15)(
ROUTED TO	3	.68	1	5958.	108.	256.	458.	1006.	2330.
		(1.76)		(168.72)(	3.06)(	7.25)(	12.97)(	28.50)(	65.97)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ZISKE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1161.00	1161.00	1164.10
STORAGE	251.	251.	343.
OUTFLOW	0.	0.	300.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1167.57	3.47	453.	5779.	6.83	15.83	0.00
.10	1163.24	0.00	317.	92.	0.00	18.08	0.00
.15	1163.89	0.00	336.	247.	0.00	16.33	0.00
.20	1164.49	.39	355.	561.	1.58	16.08	0.00
.30	1165.26	1.16	378.	1183.	3.08	16.00	0.00
.50	1166.18	2.08	407.	2352.	5.17	15.92	0.00

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 TURNER DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1145.90	1147.50	1150.00
STORAGE	154.	180.	221.
OUTFLOW	0.	20.	760.

RATIO OF	MAXIMUM RESERVOIR	MAXIMUM DEPTH	MAXIMUM STORAGE	MAXIMUM OUTFLOW	DURATION OVER TOP	TIME OF MAX OUTFLOW	TIME OF FAILURE

	(1.53)		(163.64)(	2.60)(	7.00)(	15.88)(	33.50)(	66.59)(	
HYDROGRAPH AT	.09	1	1728.	173.	259.	346.	518.	864.	
	(.23)		(48.93)(	4.89)(	7.34)(	9.79)(	14.68)(	24.47)(	
2 COMBINED	2 .68	1	6241.	227.	340.	610.	1278.	2513.	
	(1.76)		(176.72)(	6.43)(	9.64)(	17.27)(	36.19)(	71.15)(	
ROUTED TO	3 .68	1	5958.	108.	256.	458.	1006.	2330.	
	(1.76)		(168.72)(	3.06)(	7.25)(	12.97)(	28.50)(	65.97)(	

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ZISKE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1161.00	1161.00	1164.10
STORAGE	251.	251.	343.
OUTFLOW	0.	0.	300.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1167.57	3.47	453.	5779.	6.83	15.83	0.00
.10	1163.24	0.00	317.	92.	0.00	18.08	0.00
.15	1163.89	0.00	336.	247.	0.00	16.33	0.00
.20	1164.49	.39	355.	561.	1.58	16.08	0.00
.30	1165.26	1.16	378.	1183.	3.08	16.00	0.00
.50	1166.18	2.08	407.	2352.	5.17	15.92	0.00

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 TURNER DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1145.90	1147.50	1150.00
STORAGE	154.	180.	221.
OUTFLOW	0.	20.	760.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1152.53	2.53	265.	5958.	5.42	15.92	0.00
.10	1147.80	0.00	185.	108.	0.00	15.92	0.00
.15	1148.30	0.00	193.	256.	0.00	17.25	0.00
.20	1148.98	0.00	204.	458.	0.00	16.67	0.00
.30	1150.24	.24	225.	1006.	.83	16.25	0.00
.50	1151.28	1.28	243.	2330.	2.42	16.00	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 12 SEP 78
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FILM